UNIVERSITY OF CALIFORNIA
COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION
BERKELEY, CALIFORNIA

CIRCULAR 299
OCTOBER, 1925

POULTRY BREEDING RECORDS

WILLIAM A. LIPPINCOTT[1]

INTRODUCTION

Pedigree records of the larger pure-bred animals are permanently kept and given official standing by the officers of an association or society of breeders. By means of the association herd book or flock book, the exact ancestry of any animal of any breed may be traced to the foundation animals of its breed.

There are several reasons why this has not seemed feasible for poultry, but they are not important for the present purpose. The important fact is that it has not been done. Yet the poultryman who strives for improvement through breeding is in even greater need of breeding records than the breeder of larger animals. The generations of poultry follow each other in more rapid succession, and the poultry breeder frequently deals with vastly greater numbers. A man's memory may serve him fairly well in the case of a relatively small herd of cattle, but it is almost useless as a pedigree record for a large flock of chickens. This is doubly true with chicks hatched by foster mothers or in incubators. The need of records is emphasized by the very practical consideration that producers and breeders are increasingly demanding stock that is pedigreed with regard to production. Since there are no official breeding records, the individual breeder is thrown upon his own resources and must work out his own record system.

PURPOSE OF BREEDING RECORDS

The purpose of breeding records should be to answer at least four questions regarding any individual bird which has ever been mated. These are: First, who are its ancestors and what have been their

[1] A paper by the author bearing the same title, containing practically the same text and several of the same illustrations, was published by the Kansas Agricultural Experiment Station as Circular 99. The courtesy of that station in permitting its republication in a slightly revised form is gratefully acknowledged.

breeding and productive performance? Second, who are its brothers and sisters, and, if the information is available, what have been their breeding and productive performances? Third, with what individual or individuals is it at present mated, or has it been mated in the past? And fourth, what were the results of these matings?

The first question is concerned with preceding generations, the second and third consider the individual's own generation, while the fourth looks forward into the next succeeding generation.

RECORD OF ANCESTRAL PAIRS

The service most commonly associated with breeding records is furnishing information concerning the successive matings which have finally culminated in the production of any given individual; that is, making it possible to trace its pedigree accurately.

It is rather too customary in this connection to look upon a pedigree as a list of ancestral individuals. Emphasis should be given to the fact that every individual is the product of a pair of individuals, and that a pedigree is a record of ancestral—that is, parental—pairs running back through preceding generations.

In considering a given cockerel or pullet as a possible breeder, a knowledge of the breeding performance of each ancestral pair, as well as the productive performance of each ancestral female, is a matter of first importance.

Aside from the appearance of the bird, and the appearance of its brothers and sisters, its pedigree is all one has to go by, unless its parents happen to have been mated in a season previous to the one in which it was hatched. In such a case breeding or production records of older brothers and sisters may be available.

SIB RECORD[2]

It makes a considerable difference in its probable value as a breeder whether a given bird is the only outstanding product of its parents, or whether it is simply one among several almost equally good brothers and sisters. Unfortunately, a single great performance at the nest, or an individual show bird of unusual excellence, may mean little in the line of breeding progress. The chances greatly favor, however, the bird with numerous brothers or sisters nearly or quite as good as he. A good system of records should not only show, but call special attention to an individual's brothers and sisters.

[2] "Sib" is a convenient term of which the meaning is easily recalled by considering it si(ster) – b(rother). A sib record is a record of sisters and brothers.

RECORD OF MATINGS

The proper pairing of birds is the foundation of the breeder's art and the basis of improvement through breeding. The breeding unit is the pair. During any given breeding season a promising male will be mated usually with several females. And in successive seasons a given female may be mated with more than one male.

In order to give proper consideration to the pairing of birds it should be possible to study the results of former matings in the case of all individuals previously bred. For this purpose there must obviously be available a list or record of all matings.

PROGENY RECORD

In considering a pair of birds as possible parents their individuality, their ancestry, their sibs, and their previous mates are of the greatest importance. Upon them hopes are built, though predictions are uncertain. *There is but one sure basis of judging a bird's breeding value from the standpoint of heredity, and that it is by the breeding of it.* Only after a pair has been mated, and progeny gotten and grown can really accurate judgments be formed. The test of suitable mating is the character of the progeny. As suggested above, the progeny test, from the standpoint of a parental pair, is a look forward into the next generation, as the study of the pedigree is a look back into past generations, and of sibs and mates a survey of the contemporary generation. This forward look gives sounder and more dependable information than the other two combined.

The fourth service which breeding records should give, therefore, is to show the progeny of any pair in a group so that they may be readily available for study.

BREEDING RECORDS AND BREEDING PRACTICE

In breeding practice the unit of management is the pen; but as already pointed out, the breeding unit is the pair. The incubating unit is determined by the size of the incubator tray, and the time unit involved is usually one breeding season.

Except with pigeons, economic considerations generally preclude the mating of as many males as females. Usually one male mated with several females constitutes a breeding pen. While pen records are considerably better than no records and give some information regarding the breeding performance of the males, provided, always

that but one male is used in a pen, they do not give the information necessary for the best progress, or, in some cases, even the maintenance of a high level of excellence.

From the standpoint of breeding, a pen is a group of matings or pairs, with the male a member of each pair. Usually the progeny of certain pairs is more or less meritorious than that of other pairs, a fact which the forward-looking breeder should know. Some females are suitable mates for a given male, while others of as good, perhaps better, individuality and as proud a pedigree are not so suitable. The breeder's search, with the help of progeny records, is for fortunately mated pairs, and when these are discovered, there is a real foundation on which to build. A fortunate mating made one season is likely to be as fortunate a second season, barring a break in the vigor and fertility of one or both of the mates, and is both the signpost and anchor of the breeder.

These considerations, combined with the artificial incubation of eggs in large numbers has necessitated the trapnesting of all mated females during the breeding season and the marking of each egg so that the mother of each may be identified. It is in turn necessary to sort out the eggs of each female before hatching, and to arrange means of identfying each chick with its dam, through the record of matings. This also identifies it with its sire. Each step in this series of operations must be a matter of record if the whole purpose of the record is to be served.

A fact that requires consideration in breeding practice is that matings are usually made for an entire season. While the time elapsing between copulation and the appearance of a resultant fertile egg is short, the laying of that egg does not end the influence of the female's mate. The number of sperm ejaculated during a single copulation is enormous, and their length of life in the oviduct is a matter of weeks. If for some reason it is desired to mate a given female with more than one male during one breeding season, and at the same time be sure of the parentage of all offspring by both mates, it is necessary to leave the female unmated for a period of at least three weeks before introducing the second male.

Such a procedure involves the production of a larger or smaller number of infertile, and, from the standpoint of breeding, useless eggs, and a corresponding loss of valuable time during the breeding season. These considerations make the usual time unit of mating an entire breeding season.

Because of the great desirability of setting eggs soon after they are laid, and of the fact that some months are more favorable for

hatching than others, the progeny of any one pair do not appear as a single seasonal litter as in the case of swine, but are hatched periodically throughout the season. Thus full brothers and sisters of a single season may have different hatching dates, and individuals hatched on one date are likely, because at different stages of maturity, to be more desirable as breeders the following season than those hatched at some other date. It is, therefore, highly desirable to make the dates of hatching a part of the record.

KEEPING A COMPLETE BREEDING RECORD

There are five essential steps in the yearly cycle of keeping a complete flock breeding record which will furnish the information discussed above. These are: (1) Recording each mating; (2) Recording each breeding male's pedigree and progeny; (3) Recording each breeding female's pedigree, production, and progeny; (4) Marking

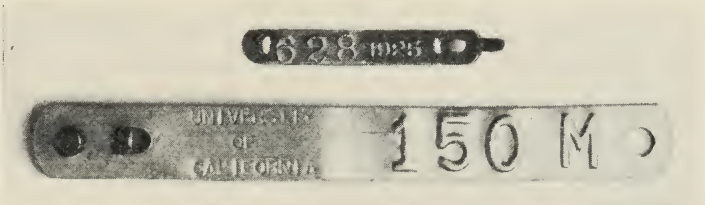

Fig. 1.—Wing-band above and leg-band below.

each egg of each breeding female as it is laid, and pedigree hatching it; and (5) Marking and recording the chicks at hatching in such a way as to identify them with their parents.

For any given mating the first step and the last two will be completed within a single breeding season, but the second and third obviously cannot be entirely completed until the breeding and productive life of the individual is over.

Record of Matings.—In order to make a record of matings, the individual breeders must be marked. The method generally approved is by a numbered metal leg-band, which may be sealed, as shown in figure 1. In the record system described in this circular, the leg-bands used on males are distinguished by a letter M following the number.

This distinction is convenient because the sex of any individual shown on the record by number is self-evident. Its further usefulness in tracing pedigrees will be indicated in a later paragraph.

It is an excellent practice to have the name of the breeder or of his farm stamped on each band. Usually this can be done with slight added expense.

For convenience in reading the numbers, the leg-bands should be put on so as to be upside down when the bird is standing. It will save time in reading band numbers when trap-nesting if the band is always placed on the left leg.

A mating record is simply a list of the birds in any given breeding pen, and is most useful for future reference. If posted in each pen, it is very helpful in preventing errors, especially for the large-scale breeder dependent on employees to do the trap-nesting during the breeding season. Fortunate is such a breeder who goes through an entire season without having at least one female escape into another breeding pen and mate.

This is perhaps not so serious where but one breed is kept except that, if not discovered, the offspring of such a hen will have a false pedigree on the record. The first requisite of breeding records is accuracy, and a false record may easily be worse than no record. A list of females posted in each breeding pen so that the trap-nester may glance at it, as he should be required to do each time he takes a female from a nest, will lead to early discovery of escaped females.

A convenient form for keeping the record of a single mating is shown in figure 2.[3] It provides a space at the left for the leg-band number of the male (172M) which heads the pen, and for his mating number (115M2004). The latter is made by combining the numbers of his sire (115M) and dam (2004), and is the basis of tracing pedigrees in the record system here described. Below the leg-band number of the male heading the pen are spaces for the leg-band numbers of one or more males held in reserve as substitutes in case the male chosen proves sterile or is otherwise unsatisfactory. In figure 2 a full brother and a half brother are indicated by their mating numbers as having been reserved.

To the right are spaces for the leg-band numbers of females in the pen, followed by their mating numbers and yearly egg records. Where pullets are mated, that fact may be indicated by writing "pullet" in the egg record space, or by leaving it blank.

The number of spaces allowed for females (in this case 12) may be increased where considered desirable, though keeping the number of females mated with one male comparatively small is to be recom-

[3] The conventions ♂ and ♀ are used to indicate the sexes. The arrow of Mars (♂) stands for the male; and the looking glass of Venus (♀) for the female.

House No. 14 S.C. White Leghorn MATING Breeding Season 1925

♂ ♂	MATING NUMBER	♀ ♀	MATING NUMBER	EGG RECORDS	♀ ♀	MATING NUMBER	EGG RECORDS
172M	115M2004	2004	85M506	205,184,179	6050	118M1950	186
RESERVES		6012	115M2006	218	6065	115M2006	253
175M	115M2004	6026	115M2006	223	6516	118M2000	Pullet
178M	115M2006	6027	115M2005	196	6547	172M6012	Pullet
		6041	117M1994	201	6551	172M6012	Pullet
		6048	117M1994	214	6560	172M6012	Pullet

NOTES This mating is made to emphasize the blood of 115M. 6041, 6048, 6050, and 6516 represent an outcross. 6547, 6551, and 6560 are daughters of 172M. 2004 is 172M's dam.

If 6041's sons are vigorous, better mate the most promising one back to his mother in 1926, if her hatching record is satisfactory this season.

Better mate 6065 to her sire in 1926 if she gives a good second year production.

Fig. 2.—Mating record.

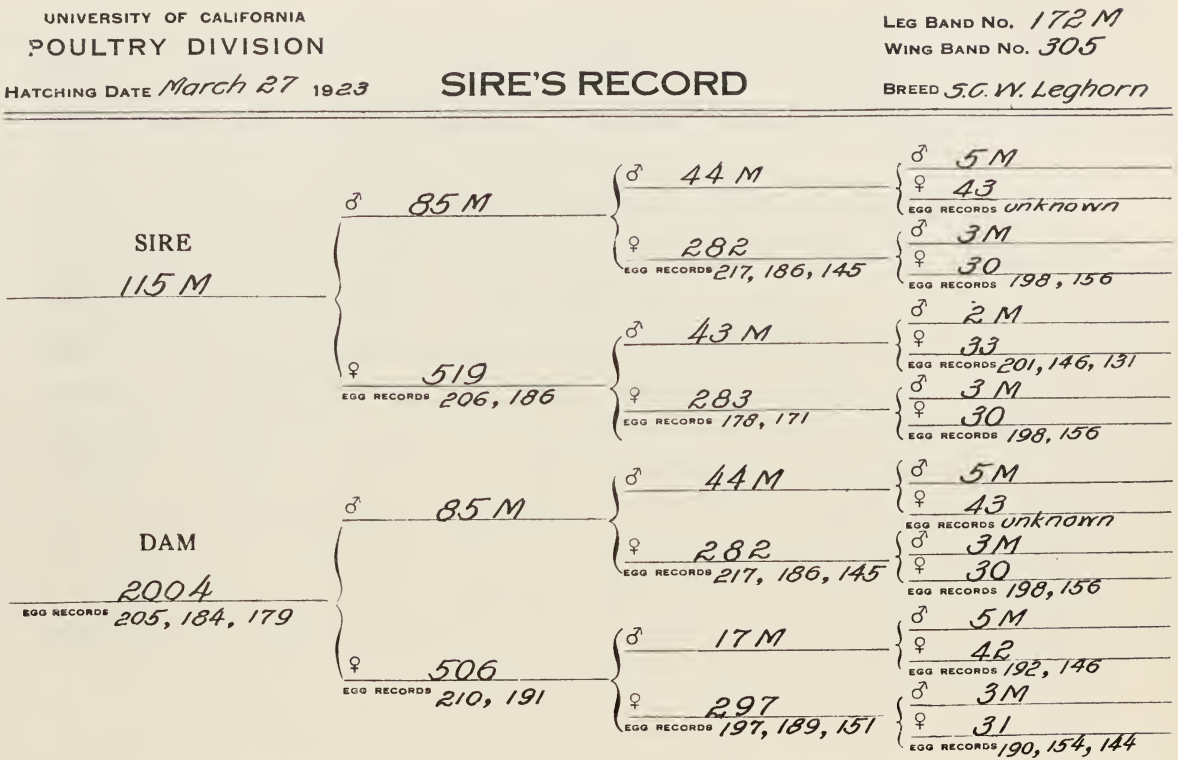

Fig. 3.—Sire's record, showing pedigree.

mended. Such a practice probably increases the percent of fertile eggs, and, what is even more important, applies the progeny test to a larger number of males.

In the space below, headed "Notes," it is usually advisable to make a record of any special reasons for making the whole mating or for including certain females in the pen. When very few pens are mated this is perhaps not quite so necessary; but even then it is very useful, and is increasingly so in the case of extensive breeding operations.

The reverse side of the form shown in figure 2 is shown in figure 19, and is the first page of the "Progeny and Sib Record" of that mating. This record will be discussed in a later paragraph.

Sire's Record.—The sire's record should furnish at least three sorts of information; viz., (1) his ancestry (or pedigree); (2) his progeny; and (3) notes on his individuality and breeding performance.

A convenient blank form for the pedigree is shown in figure 3. If of one's own breeding, so that he was "pedigree hatched," it is well to give his wing-band number (to be discussed later) as well as his leg-band number, as shown in the upper right-hand corner. Leg-bands are likely to wear out and be lost particularly in the case of male birds. The wing-band number is always to be found elsewhere in the breeding record, so that any bird losing its leg-band can be certainly identified, even if the breeder does not know him as an individual. It is also convenient to have the wing-band number on the sire's record, and this will inspire confidence in actual or prospective buyers of pedigreed breeding stock.

The breed of the individual should always be indicated on the pedigree of any bird sold, and it is a good practice to have it on all pedigrees. Where a single variety is bred, the breed and variety is usually printed as a part of the blank. The year date, and if possible the exact date of hatching, should be indicated, as shown in figure 3.

The pedigree of a male used as a breeder should be completely recorded for at least four generations if possible. In beginning a pedigree record system, unless one purchases foundation stock from some one who has kept breeding records, this is of course not possible. As the successive generations follow, however, an increasingly complete ancestral record may be given. The method of tracing a pedigree as recorded in figure 3 will be described in a later paragraph.

DAUGHTERS' RECORDS						NOTES
LEG BND NO.	RECORDS	LEG BND NO.	RECORDS	LEG BND NO.	RECORDS	
6547	213	6619	226	7066		Very like his sire in appear-
6548	196	6620	203	7070		ance and behavior.
6550	201	7012		7072		Fertility excellent season
6551	237	7013		7080		1924. Should be mated to
6560	241	7014		7094		daughters out of daughter
6566	207	7016		7095		(6547, 6551, 6560) if the
6570	178	7020		7098		daughters' eggs hatch
6575	180	7024		7099		well and the get are
6576	199	7025		8002		growthy and vigorous.
6580	211	7026		8003		Fertility during 1925 very
6583	died before completing record	7027		8014		fair but not so good as in
6585	156	7028		8020		1924. Daughters out of
6586	210	7034		8022		6560 appear most
6587	sold	7035		8024		promising July 1925.
6591	213	7040		8039		
6600	219	7042		8040		
6607	189	7050		8042		
6608	Died	7051		8049		
6610	sold	7054		8070		
6612	114 sold	7062		8072		
6613	206	7063		8084		
6617	191	7064		8090		

Fig. 4.—Reverse of sire's record shown in figure 3.

As previously indicated—and this cannot be too strongly emphasized—the breeding value of any individual is most accurately judged by the character of his or her progeny. In breeding for high egg production, the egg records of a given male's daughters are of particular value in forming a judgment concerning that male. The importance of the records of his grand-daughters by his sons must not be overlooked, but these will not be available until a year later than the records of the daughters of his first breeding season. It is not likely that all the sons will be mated in the breeder's own pens where a complete record of the daughters of all of them will be available.

It is a mistake to over-emphasize the importance of a few successful daughters and under-emphasize the importance of the unsuccessful ones. The sire's record should show *every daughter* (and her record) of each succeeding season that he is mated.

It is quite apparent that this record cannot be made for a sire's first daughters until after he has been mated, the daughters grown, and their records brought in, by which time the sire in question will be approaching his third breeding season. In practice, all of a given male's get in any one season will be listed in the "Progeny and Sib Record" for the pen which he heads that season. When the daughters mature and are leg-banded, their numbers may be listed in numerical order in the spaces provided on the reverse side of the "Sire's Record," as shown in figure 4. The egg records of the respective daughters are entered later as they are completed.

In the space provided for "notes," brief record should be made concerning the production of the sire's sisters, the breeding performances of his brothers, the breeding performances of his sons, or other facts bearing on his value as a breeder. The fact that offspring out of certain females are usually better than others should be noticed and particularly successful mates noted. Not infrequently the space allotted for this information as shown in figure 4 will be insufficient, and must be supplemented by an additional sheet.

Dam's Record.—The dam's record should cover the same points of information as the sire's, and in addition give her egg production. The blank form used consists of an "Individual Egg Record" (fig. 5) with spaces on the reverse side for her ancestral records, for her daughter's records, and for further notes (fig. 6). It is helpful also to have a system of reminder checks to ensure the entering of the information furnished by the completed dam's record, in her sire's, dam's, sons', and daughters' records, respectively, as shown in the lower right hand corner of figure 6.

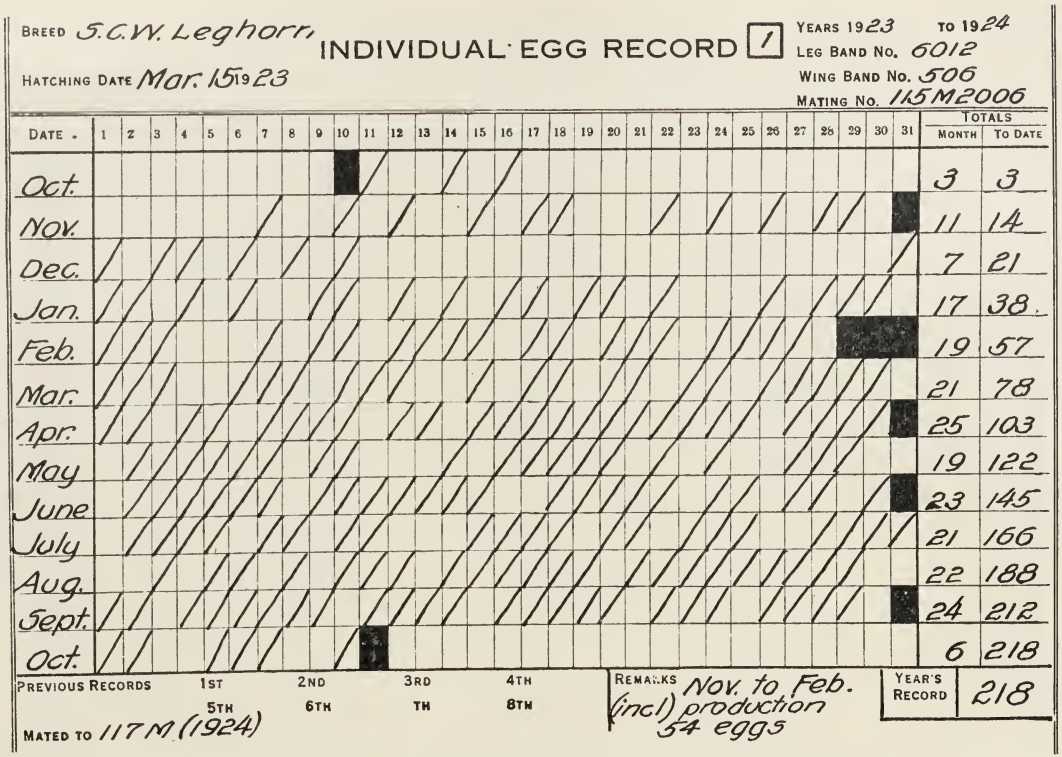

Fig. 5.—Individual egg record, a part of the dam's record. The spaces just preceding the beginning of the laying year and just following the end of it, as well as the extra spaces for months having less than 31 days, are blotted out with the aid of a stamp when the record is started. The practice is useful as a safeguard against certain kinds of errors in recording.

UNIVERSITY OF CALIFORNIA
FOULTRY DIVISION

♂ 115 M

♂ 85 M

♀ 519
EGG RECORDS 206-186

♂ 44 M
♀ 282
EGG RECORDS 217-186-145

♂ 43 M
♀ 283
EGG RECORDS 178-171

♀ 2006
EGG RECORDS 221-197

♂ 85 M

♀ 505
EGG RECORDS 199-180

♂ 44 M
♀ 282
EGG RECORDS 217-186-145

♂ 45 M
♀ 284
EGG RECORDS 199-156

NOTES

In 1924 this bird gave a fertility of 92% and a hatchability of 95% of fertile eggs set. Her eggs were running a little over two oz. during the hatching season. Sons and daughters growthy. Daughters better than sons.

DAUGHTERS' RECORDS

Leg Band No.	Records	Leg Band No.	Records	Leg Band No.	Records
6547	213	7064			
6551	237	7080			
6560	241	7099			
6570	178	8003			
6583	INC.	8014			
6587	SOLD	8022			
6607	189				
6613	206				
6620	203				
7020					
7026					
7035					

Leg Band Entered
- Chick Index ☑
- Progeny and Sib Record ☑
- Sire's Record ☑
- Dam's Record ☑

Egg Record Entered
- Sire's Record ☑
- Dam's Record ☑
- Son's Records ☑
- Daughter's Records ☑

Fig. 6.—Reverse of individual egg record shown in figure 5. A part of the dam's record.

The "Individual Egg Record" gives an opportunity to see and study a whole year's production with its cycles and pauses and is preferable to simply keeping monthly and yearly totals. A new sheet is needed for each succeeding year's production. In practice, the several years' records of each hen trapnested are filed together, forming a continuous record. The information given on the reverse side of the first form serves for the entire record and need not be repeated.

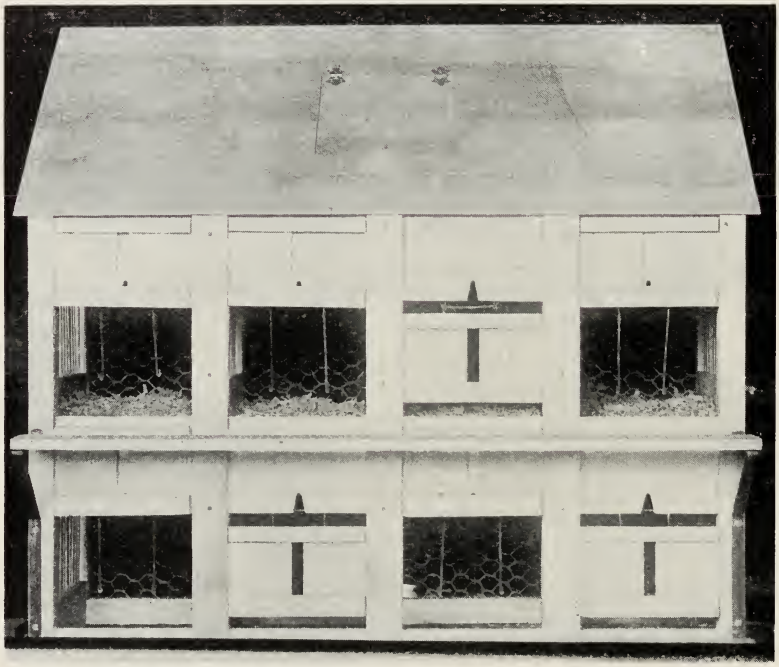

Fig. 7.—Trap-nests which are accurate, economical to build, and simple to operate. Modeled after a nest brought from England, original designer unknown.

In cases where the spaces for daughters' records and for notes on the first year's record sheet are not sufficient, use may be made of those on the backs of the second and later years' records.

Trap-Nesting.—A necessary adjunct of pedigree breeding is the trap nest. While it appears to be possible to secure a reasonably accurate count of the number of eggs a given female lays by handling her each morning, no means have so far been developed of identifying an individual egg with the hen that laid it, except by making it impossible for her to leave the nest after laying until some one releases her. This gives an opportunity for reading her leg-band

number and recording it on the egg, from which it is posted later in her individual record.

In districts of California serving markets which object to figures on the shells of commercial eggs, it is the practice to use daily trapnest sheets. These sheets carry in numerical order, the leg-band numbers of all hens and pullets being trapped during a given season. They are hung in the pens or are carried from pen to pen by the trapnester. The numbers may have any range, as for example, 1 to 309, or from 3045 to 4158, according to the range necessary to include all females being trapped. When a given female whose eggs are to go to market lays, a line is drawn through her number, but nothing is written on her egg. A new sheet (or sheets) is used each day and the individual egg records are then posted from these daily trapnest sheets.

Aside from the advantage of having to make no marks on the eggs, there is the convenience of being able to post the individual egg records at leisure, say once or twice a week instead of every day. This convenience is likely to be abused, however, unless one is systematic and has a regular, definite, and fairly frequent time for bringing the individual records up to date.

Accuracy in Trap-Nesting.—The trap nest that is absolutely mistake proof has not yet been devised, though there are several that are very accurate. One of these is shown in figure 7. The number of eggs laid on the floor may be reduced to from 1.5 to 3 per cent by careful management. It is not these eggs, however, which are the greatest problem from the standpoint of pedigreeing. The hen laying on the floor or dropping an egg from the perch fails to be credited with that egg, or if it is hatched, the chick goes unpedigreed on its dam's side. There is a lack of information, but no misinformation. It is the wrongly credited egg that may prove serious, leading to the recording of a spurious pedigree.

Aside from the eggs laid outside the nest, errors in trap-nesting are most likely to arise through the efforts of two hens to enter the same nest at the same time. If both are successful the trap-nester discovers the situation. It is when one hen enters while the other prevents the trap door from closing that error is most likely to go undiscovered. The first hen lays and comes out. The second hen enters and is found on the nest with an egg, which is credited to her. She is released, and not infrequently fails to return to the nest that day, in which case the error may not be detected. If she does return and lay, suspicion will be aroused by the appearance of two eggs bearing her number. If on comparison marked differences between the eggs were found, one would be safe, though by no means certain, in assum-

ing that both were not laid by the same hen. If the eggs were closely similar it would be difficult to decide whether the hen had actually laid two eggs in one day (which sometimes undoubtedly occurs), or whether there was a trapnest error. In such a situation, the safe course from the standpoint of pedigree accuracy, since one cannot be sure which egg belongs to the hen credited with both, is to pedigree-hatch neither, or to record the resulting chicks as the progeny of male heading the pen out of an unknown dam.

It is a useful habit, when trap-nesting, to write the band-numbers on the small end of eggs which are to be incubated. This part of the shell is least frequently broken by the chick as it emerges. It is in fact so seldom destroyed, unless insufficient moisture is supplied in the incubator, as to make it unnecessary to include identifying labels in the pedigree trays or sacks.

Identifying Wrongly Numbered Eggs.—In order to discover, if possible, the few eggs which are credited to the wrong females during the breeding season, and which if hatched would be entered on the records as the progeny of the wrong dam, provision should be made for the inspection and comparison of all eggs that have been credited to each female and that have been saved for hatching. This should be done every time eggs are put into the incubator, and may be done most conveniently by assembling the eggs of each female, as a matter of routine, as they are brought in and recorded.

One section of a home-made cabinet for this purpose, devised by Dr. H. D. Goodale at the Massachusetts Agricultural Experiment Station, is shown in figure 8. It is a chest of trays fitted with grooves so that the eggs lie in rows, one groove being reserved for each mated female and bearing a label with her leg-band number. Each egg, after being recorded in the proper egg record, is slipped into the front end of the groove bearing its number. If there are eggs already in the groove these are rolled back and thus automatically turned. When "setting day" comes, all the eggs of each mated female are found together, and after being carefully scrutinized are put into the incubator tray together.

If on inspection the eggs in any one groove are found to be closely similar in shape, shell texture, and color (in the case of eggs from breeds showing variation in shell color), it is probable that no mistake has been made. If an egg that is noticeably different from the others in several particulars is found, it is safe to assume that an error has been made. Such an egg should be discarded, or its number changed from that of the female to that of the male heading the pen, so that it will be recorded as the offspring of the certainly known parent only.

Pedigree Hatching.—In so incubating eggs that the chicks of each hen may be identified, ordinary practice is followed until the eighteenth day of the incubation period, with two exceptions. First, it saves time later if care is taken that at each setting all eggs that have accumulated from any one hen go into the same egg tray. Second, the

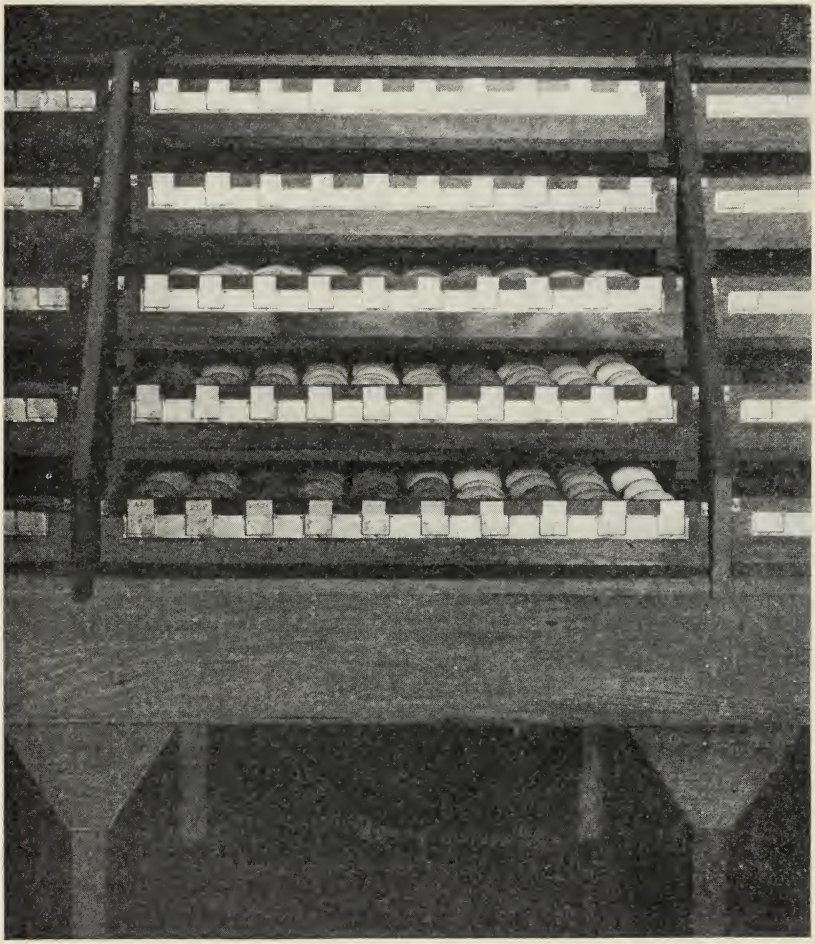

Fig. 8.—Pedigreed egg cabinet designed by Dr. H. D. Goodale. One section accommodates the eggs from 50 mated females. Courtesy Kansas Agricultural Experiment Station.

second testing for live eggs should be delayed until the eighteenth day. Or if preferred, the customary fourteenth day testing may be made, and a third test made on the eighteenth day.

The reason for delay is that a considerable proportion of the fertile eggs which die do so between the fourteenth and eighteenth days

(shown by Payne[4] to be about 19 per cent, or more than half of the average death rate of 35 per cent between the seventh and eighteenth days). No dead eggs should be left to be carried through the pedigree hatching process.

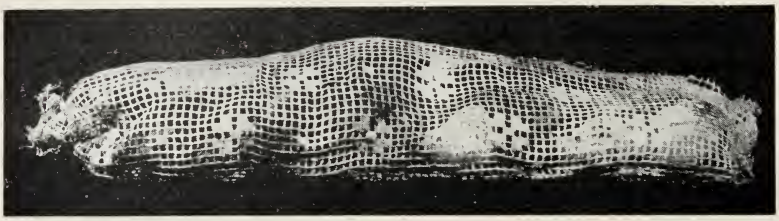

Fig. 9.—Pedigree sack containing seven chicks from seven eggs set. Courtesy Kansas Agricultural Experiment Station.

On the eighteenth day all the eggs of each mated female are put into a separate sack, small tray, or wire basket (figs. 9, 10, 11 and 12), so arranged that the chicks cannot escape after hatching and can be identified with their mother by the numbers on the shells.

Fig. 10.—Looking down on an egg tray full of pedigreed chicks in sacks. Courtesy Kansas Agricultural Experiment Station.

Hatching Record.—The record of a given female's performance as a breeder is quite incomplete unless it includes her hatching record. So much emphasis has been laid upon a hen's ability as a producer of eggs that the importance of her ability as a reproducer of chicks has been largely overlooked. A first requisite of an individual's success as a breeder is that it shall be an efficient reproducer. Sterility or a

[4] Payne, L. F. Distribution of mortality during the period of incubation. Journal of American Association of Instructors and Investigators in Poultry Husbandry. 6:9–12. 1917.

tendency toward sterility on the part of a male will usually be noticed because it affects the hatching record of a whole breeding pen. But low hatching power of the eggs of an individual female, and, conversely, exceptionally high hatching power of another individual

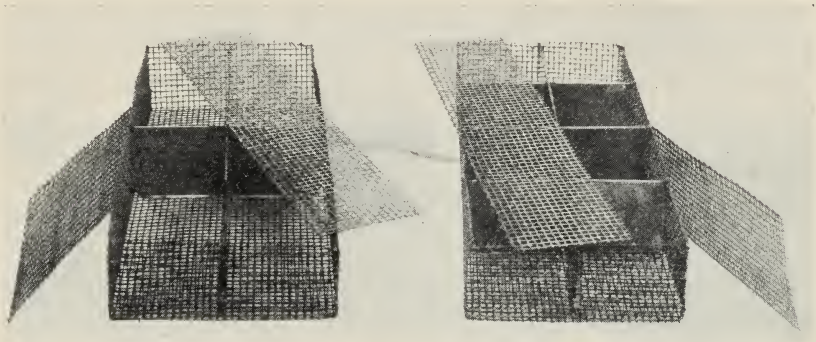

Fig. 11.—Home-made pedigree baskets. Courtesy Hollywood Farms.

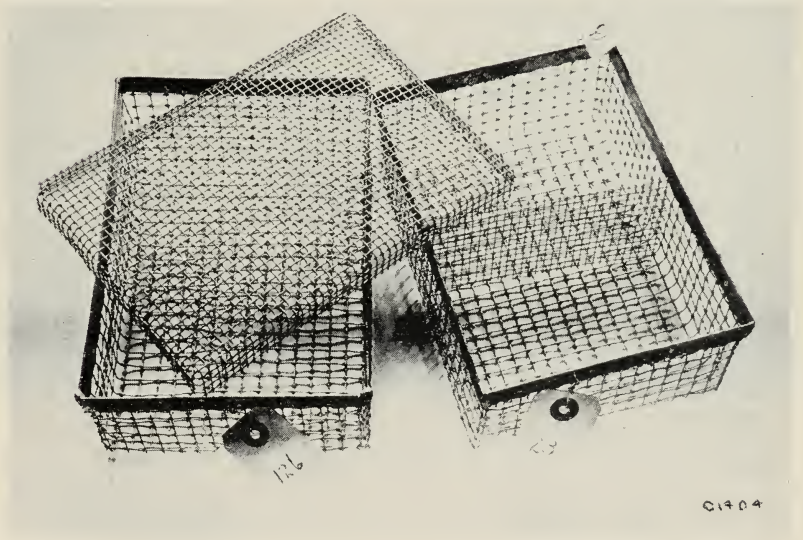

Fig. 12.—Another style of pedigree basket. Courtesy Maine Agricultural Experiment Station.

female in the same pen, are likely to go unnoticed unless the relationship between the number of eggs set from each individual and the number of chicks hatched during an entire season is a matter of record. Whether the eggs failing to hatch do so because of actual infertility or of a failure of the fertile eggs to hatch should also be recorded.

INDIVIDUAL HATCHING RECORD Season of 1925

UNIVERSITY OF CALIFORNIA

Mated with 180M Legband 6003

Date Set	Numbers Set	Infertiles	Dead Germs (1)	Dead Germs (2)	Dead in Shell	Cripples	Vigorous Chicks	Date Hatched	Remarks
2-14	3		1		1		1	3-7	Eggs a
2-21	6				1	1	4	3-14	trifle
2-28	5		1	1			3	3-21	thin
3-7	7	1		1	1		4	3-28	shelled
3-14	4		1				3	4-4	
3-21	5				1		4	4-11	
3-28	4	1	1				2	4-18	
4-4	5				2		3	4-25	
4-11	5			1			4	5-2	
4-18	3		1				2	5-9	
4-25	6	1			2		3	5-16	

Total Number of Eggs Set	53	
Number of Infertiles	3	
Number of Fertiles	50	
Per Cent Fertility	94.3	
Number of Fertiles Not Hatched	16	
Number of Fertiles Hatched	34	
Per Cent of Fertiles Hatched	68.0	
Per Cent of Total Eggs Hatched	64.2	

Fig. 13.—Individual hatching record—a part of the dam's record.

Usually there are a few hens in a breeding pen whose eggs hatch poorly. Their removal will increase considerably the average hatchability of that pen. What is more important the removal of these individuals lessens the likelihood of making poor hatchability an inherent quality of the flock.

A convenient form for keeping such a record is shown in figure 13 and is largely self-explanatory. On March 7, for instance, seven eggs from hen 6003 mated with 180M were set. One of them was infertile,

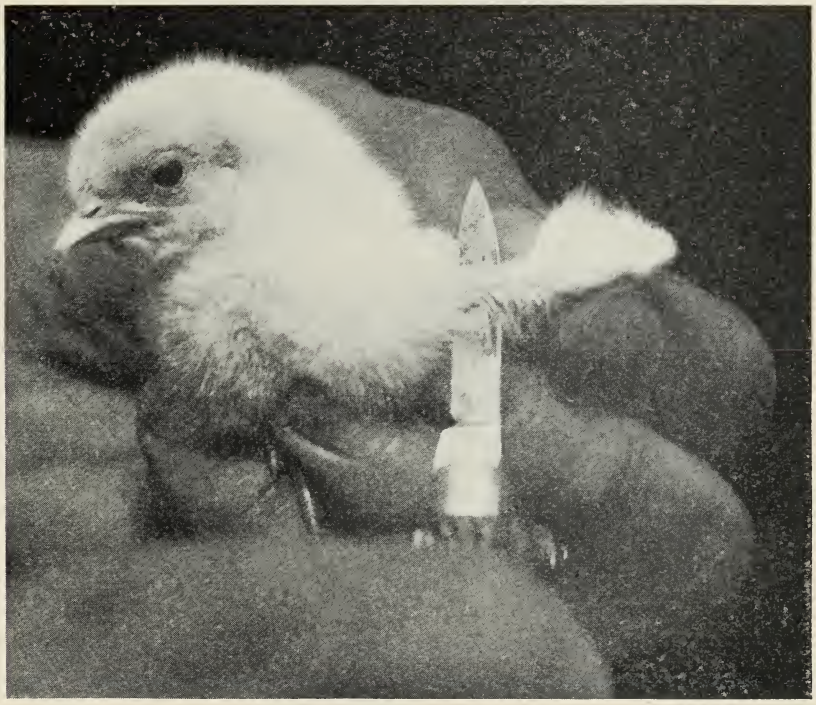

Fig. 14.—Making the incision for a wing-band in a newly-hatched chick. Courtesy Kansas Agricultural Experiment Station.

none were taken out at the first test as dead, but one was dead at the second test, and another failed to get out of the shell; there were no cripples, and four vigorous chicks were hatched on March 28. The calculations of this hen's hatching performance for the season are given at the bottom of the page.

Marking and Recording the Chicks.—After the hatch is over, the next step is to mark the chicks. This is done by a small numbered band placed on the leg or through the wing. Usually when leg-banding is practiced, the band is later changed from the leg to the

wing, where it remains during the life of the bird. If left on the leg is must be loosened from time to time as the chick grows, or it causes lameness, soon followed by deformity. In a comparatively short time the small band is outgrown and must be replaced by a larger one, which with some breeds must in turn be replaced by a still larger leg band. Much labor is saved during the busy hatching and rearing season if at the time a band is first loosened it is taken from the leg and slipped through an incision made in the skin of the web of the wing (figure 14), where it remains permanently.

Fig. 15.—Wing-band in place on a newly-hatched chick.
Courtesy Kansas Agricultural Experiment Station.

The labor of changing the bands from the leg to the wing, a considerable item where large numbers of chicks are handled, is saved if the bands are placed in the wing at hatching time, as is being done in figure 14. The band in place is shown in figure 15, and on a mature bird in figure 16. In either case a small number of bands are lost, and therewith the identity of the chicks.

It has not been determined by careful experiment dealing with large numbers, whether early or late wing-banding is the more efficient. As the result of experience in marking many thousands of chicks by both methods at the Kansas and California Agricultural Experiment Stations, the practice of putting the chick-band first on the leg was discontinued. The chicks are now wing-banded as they are taken from the pedigree sacks. If properly done, the insertion of the wing-bands causes little discomfort and almost no bleeding, and

the bands need no further attention. If not properly placed (figure 17) they may slip around the wrist joint of the wing, as shown in figure 18, where as the wing grows they cause great discomfort, and ultimately a deformity.

The wing-bands are numbered serially. Owing to their small size it is undesirable to have the figures run up into many places. This

Fig. 16.—Wing-band as it appears on a mature bird. Courtesy L. C. Beall, Jr.

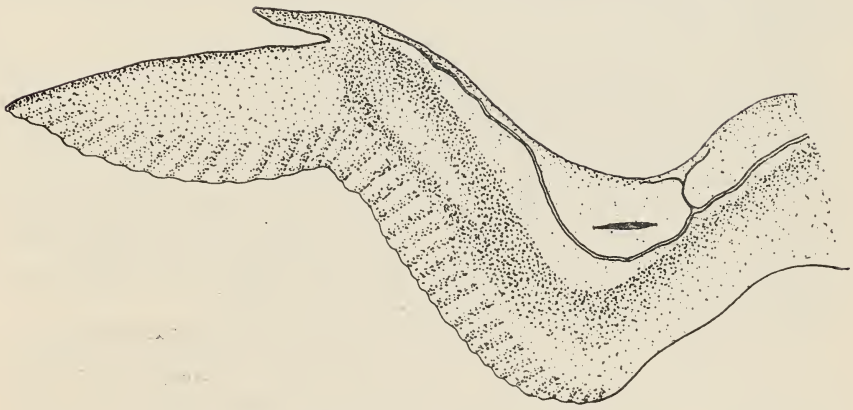

Fig. 17.—Sketch of plucked wing, showing where the incision should be made.

may be avoided by having the numbers begin with 1 each season, and having the year date appear on each band in small numerals, as shown in figure 1. In this way no confusion arises through using the same series of numbers each season.

At the time the chick is banded, the number on the band should be recorded with its mating number. If the chicks are recorded by matings in the Progeny and Sib Record, the first page of which is the reverse side of the Mating Record (figure 19), it is necessary to record only the wing-band number in the column of the proper dam.

Fig. 18.—A wing-band improperly placed, which has slipped around the wrist joint of the wing of a three-weeks-old chick. Courtesy Kansas Agricultural Experiment Station.

It will save time at a very busy season, however, if use is made of the form, shown in figure 20, called the "Chick Index," and the wing-band numbers entered serially in advance. It is then necessary to enter only the mating number of each chick as it is banded, opposite the number of its wing-band. The bands are used serially, having previously been strung in order. At some later and less busy season, after the stock is mature enough for leg-banding, the Progeny and Sib Record may be made up from the Chick Index.

Two forms of the Chick Index are shown in figures 20 and 21. The first is the more compact. The second makes allowance for entering brief but often very valuable notes, made from time to time during the progress of rearing.

Breed S.C.W. Leghorns **PROGENY AND SIB RECORD** ☑ Sire No. 172M Breeding Season 1925

DAM NO 2004		DAM NO 6012		DAM NO 6026		DAM NO 6027		DAM NO 6041		DAM NO 6048	
LEG BAND NO	WING BAND NO	LEG BAND NO	WING BAND NO	LEG BAND NO	WING BAND NO	LEG BAND NO	WING BAND NO	LEG BAND NO	WING BAND NO	LEG BAND NO	WING BAND NO
7012	1401	died	735	8042	641	sold	1216	sold	637	7028	978
sold	1402	8014	736	sold	642	7034	1217	7070	638	died	979
8020	1605	sold	737	7072	1423	died	1218	7040	639	7014	980
7094	1606	7035	1376	7063	1424	died	1419	212M	640	sold	1397
8039	1607	7026	1377	died	1425	7027	1420	sold	1384	214M	1398
7024	2184	7099	1642	8040	1426	210M	1421	sold	1385	7042	2022
208M	2185	7064	1643	7054	2269	7013	1422	7098	2084	7095	2023
died	2382	7080	1644	died	2270	sold	1958	7066	2085		
sold	2383	7020	1645	8024	2340	8002	1959	sold	2086		
8049	2384	8003	2278	230M	2341	216M	1960				
		died	2279	sold	2342	sold	2293				
		8022	2280			8070	2294				
						died	2295				

Fig. 19.—Progeny and sib record appearing on the reverse of the mating record (figure 2).

UNIVERSITY OF CALIFORNIA
POULTRY DIVISION

CHICK INDEX

NUMBERS 1375 TO 1411
DATE HATCHED Apr. 12 1925
NUMBERS 1412 TO 1430
DATE HATCHED Apr. 19 1925

WING BAND NO	MATING NUMBER	LEG BAND NO	WING BAND NO	MATING NUMBER	LEG BAND NO	WING BAND NO.	MATING NUMBER	LEG BAND NO	WING BAND NO	MATING NUMBER	LEG BAND NO
1375	180 M 6140	7019	1389	180 M 6023	215M	1403	172M 6065	Dis- appeared	1417	190M 6220	235M
1376	172M 6012	7035	1390	184 M 6049	Died	1404	172M 6065	7050	1418	190M 6220	7068
1377	172M 6012	7026	1391	184M 6049	7071	1405	172M 6065	7016	1419	172M 6027	Died
1378	184 M 6213	Died	1392	184 M 6049	Sold	1406	172M 6065	203M	1420	172 M 6027	7027
1379	184M 6213	Sold	1393	184 M 6049	7011	1407	172M 6065	Sold	1421	172M 6027	210M
1380	180 M 6005	7065	1394	184 M 6350	224M	1408	172M 6560	Died	1422	172M 6027	7013
1381	180 M 6005	209M	1395	184 M 6350	7022	1409	172M 6560	7062	1423	172 M 6026	7072
1382	172 M 6547	8072	1396	184 M 6350	Died	1410	172M 6560	7051	1424	172M 6026	7063
1383	172 M 6547	8090	1397	172M 6048	Sold	1411	172M 6560	7025	1425	172M 6026	Died
1384	172 M 6041	Sold	1398	180M 6382	214M	1412	180M 6003	7017	1426	172 M 6026	8040
1385	172 M 6041	Sold	1399	180 M 6382	7028	1413	180M 6003	Not banded	1427	184M 6047	8016
1386	180M 6023	7055	1400	180 M 6382	220M	1414	180M 6003	7023	1428	184M 6047	Sold
1387	180M 6023	7092	1401	172M 2004	7012	1415	190M 6220	250M	1429	190 M 6289	7073
1388	180 M 6023	Died	1402	172 M 2004	Sold	1416	190M 6220	7096	1430	190M 6289	241M

Fig. 20.—Compact form of chick index.

Leg-Banding.—While the wing-band furnishes an accurate means of identifying individuals, it is neither quick nor convenient. The wing-band is small, and on the adult bird is hidden among the contour feathers of the wing. To lay back these feathers so that the number may be read when trap-nesting takes so much time as to be impractical. On this account, birds are marked a second time with leg-bands, as described on page 5.

There are numerous methods of numbering these adult bands, several of which are perhaps equally good. With any method it should be a cardinal principle that numbers are never duplicated. Some leg-band manufacturers recognize this fact to the extent of refusing to sell duplicate bands to a breeder, thereby rendering a valuable but not always appreciated service to beginners.

Some breeders prefer to make the wing-band and leg-band numbers correspond. While such a practice is convenient in some ways, in the long run it is of doubtful value. Unless the method of numbering leg-bands suggested above for wing-bands, or its equivalent, is resorted to so as to keep the size of the numbers comparatively small, in a few years they will become too large to find space on the wing-band.

While such a scheme works very well for wing-bands whose numbers are copied on the records a very few times, and in such a way that the year date need appear but once on a page containing many wing-band numbers, the situation is very different with leg-band numbers. Those of the females must be written on the eggs many times, during the breeding season at least, and many more times on pedigrees. In either case, the numbers under such a method are needlessly cumbersome and unwieldly.

On the other hand, if the wing-bands were to be numbered in series continuing from year to year as suggested for the leg-bands, the breeder would be forced to one of two alternatives. He must either waste many leg-bands or do his own leg-band numbering. In the best-bred flocks under the most approved methods of management, a larger or smaller number of pedigreed chicks die or are discarded as unfit for survival. Each dead or discarded chick carries a number which cannot be used for an adult bird. If ready-numbered leg-bands are used, those carrying these numbers must be thrown away. If one makes it a practice to buy blank bands and number them oneself, which is less economical, there are wasted numbers which force the size of the numbers up with undue rapidity, hastening the day when a letter must be used on the female leg-bands and changed from time to time in the interest of shorter and less unwieldy numbers. Thus

UNIVERSITY OF CALIFORNIA
POULTRY DIVISION

CHICK INDEX

NUMBERS 1401 TO 1411
DATE HATCHED Apr. 12, 1925
NUMBERS 1412 TO 1414
DATE HATCHED Apr. 19, 1925

Wing Band No.	Mating Number	Leg Band No.	Notes
1401	172M2004	7012	
1402	172M2004		♂ Sold to Geo. Hemphill
1403	172M6065		Disappeared on free range.
1404	172M6065	7050	
1405	172M6065	7016	
1406	172M6065	203M	July 15; Most promising ckl. of his age at 3 mo. Save for own breeding.
1407	172M6065		♂ Sold to John Ererhardy
1408	172M6560		Died at 2 months.
1409	172M6560	7062	
1410	172M6560	7051	Sept. 16, Coming into laying at 5 mo.
1411	172M6560	7025	
1412	180M6003	7017	
1413	180M6003		♀ Weak; not legbanded.
1414	180M6003	7023	

Fig. 21.—Chick index with notes.

when the number 9999 was reached, it if seemed undesirable to extend the numbers to another place, as would be necessary with 10,000, a new start could be made with A1. A hen with this number mated with 906M would appear thus—906MA1—in the mating numbers of her chicks. It will be obvious that if the wing-band and leg-band numbers agree, the columns in the "Chick Index" headed "Leg Band No." are unnecessary.

With the plan of numbering used in this circular, when the pullets are put in the laying house in the fall and the best cockerels are reserved as possible breeders, the leg-band numbers given must be recorded opposite the respective wing-band numbers. The cockerels destined for sale as breeders, and this also applies to any pullets to be sold, should not be leg-banded. Purchasers will prefer to use their own leg-bands, and the identity of the birds can be determined by the wing-bands.

TRACING PEDIGREES

Where a sire's record is kept for every male used as a breeder, and individual egg records are used for all females trap-nested, it is unnecessary to keep a separate flock breeding record corresponding to the official herdbooks of other pure-bred live stock. Such a record is automatically kept by the two records named above. Each chick hatched has its mating number, which makes known its sire and dam. The sire's record (figure 2) shows the sire's mating number, which makes known the chick's paternal grandsire and granddam. The dam's egg record (figure 5) shows her mating number. The mating numbers of the grandparents will be shown on their respective records and the numbers of the eight great-grandparents learned. The mating numbers of these individuals in turn will appear on their records, and so the ancestry may be traced back to the foundation breeders of the flock, or to the individuals which were the first recorded.

For the sake of making clear the use of the mating number in writing pedigrees, without unduly increasing the number of illustrations, as would be necessary to show all the sires' records and egg records of the individuals involved, pages from a "Flock Breeding Record" are shown in figures 22 and 23, from which the pedigree in the "Sire's Record" shown in figure 3 may be traced. It should be clearly understood, however, that these figures are for convenience of illustration only and are not essential to keeping a complete breeding record unless one is not keeping egg records. In this case the "Flock Breeding Record" would be necessary for the females.

UNIVERSITY OF CALIFORNIA
POULTRY DIVISION

FLOCK BREEDING RECORD

Band Nos. 1 to 56

LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER
1	Standard-bred Parents unknown	15	Purchased of Koons	29	Purchased of Jones	42	Standard-bred Parents unknown
2	Standard-bred Parents unknown	16	Standard-bred Parents unknown	30	Purchased of Cornell Univ.	43	Purchased of Wilson
3	Purchased of Koons	17	Standard-bred Parents unknown	31	Standard-bred Parents unknown	44	Purchased of Harris
4	Purchased of Koons	18	Purchased of Iowa State College	32	Standard-bred Parents unknown	45	Standard-bred Parents unknown
5	Purchased of Jones	19	Standard-bred Parents unknown	33	Purchased of Jones	46	Purchased of Morris

UNIVERSITY OF CALIFORNIA
POULTRY DIVISION

FLOCK BREEDING RECORD

Band Nos. 281 to 336

LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER
281	1 M 28	295	3 M 31	309	5 M 43	323	1 M 15
282	3 M 30	296	3 M 32	310	2 M 33	324	1 M 27
283	3 M 30	297	3 M 31	311	3 M 30	325	1 M 29
284	1 M 29	298	1 M 27	312	3 M 31	326	1 M 31

UNIVERSITY OF CALIFORNIA
POULTRY DIVISION

FLOCK BREEDING RECORD

Band Nos. 505 to 560

LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER
505	45 M 284	519	43 M 283	533	17 M 207	547	45 M 284
506	17 M 297	520	45 M 284				

UNIVERSITY OF CALIFORNIA
POULTRY DIVISION

FLOCK BREEDING RECORD

Band Nos. 673 to 728

LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER
			14 M 314	701	26 M 115	715	25 M 112
						716	26 M 114

UNIVERSITY OF CALIFORNIA
POULTRY DIVISION

FLOCK BREEDING RECORD

Band Nos. 1961 to 2016

LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER
1961	85 M 505	1975	85 M 505	1989	84 M 499	2003	84 M 498
1962	84 M 500	1976	85 M 506	1990	85 M 505	2004	85 M 506
1963	84 M 499	1977	84 M 498	1991	86 M 450	2005	85 M 505
					85 M 505	2006	85 M 505

UNIVERSITY OF CALIFORNIA
POULTRY DIVISION

FLOCK BREEDING RECORD

Band Nos. 5969 to 6024

LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER
5969	118M 1950	5983	115 M 2006	5997	117 M 1994	6011	115 M 2006
5970	118 M 1951	5984	115 M 2005	5998	117 M 1994	6012	115 M 2006
5971	118 M 1950	5985	117 M 1994				

Fig. 22.—Flock breeding record for females.

UNIVERSITY OF CALIFORNIA
POULTRY DIVISION

FLOCK BREEDING RECORD

Band Nos. 1 M to 56 M

LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER
1 M	Purchased of Uni. of Wisc.	15 M	1 M 16	29 M	5 M 43	43 M	2 M 33
2 M	Purchased of Langford	16 M	3 M 27	30 M	5 M 44	44 M	5 M 43
3 M	Purchased of Langford	17 M	5 M 42	31 M	3 M 27	45 M	1 M 15
4 M	Purchased of Kelly	18 M	1 M 16	32 M	1 M 45		
	Purchased of						

UNIVERSITY OF CALIFORNIA
POULTRY DIVISION

FLOCK BREEDING RECORD

Band Nos. 57 M to 112 M

LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER
		43 M 283	85 M	44 M 282		99 M	45 M 284
						100 M	45 M 284

UNIVERSITY OF CALIFORNIA
POULTRY DIVISION

FLOCK BREEDING RECORD

Band Nos. 113 M to 180 M

LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER	LEG BAND NUMBER	MATING NUMBER
113 M	84 M 500	127 M	99 M 613	141 M	85 M 520	169 M	84 M 500
114 M	85 M 505	128 M	100 M 621	142 M	85 M 521	170 M	100 M 1079
115 M	85 M 519	129 M	84 M 501	143 M	84 M 500	171 M	99 M 1802
116 M	85 M 519	130 M	84 M 500	144 M	84 M 501	172 M	115 M E004

Fig. 23.—Flock breeding record for males.